Carbon Farming

Stored Water Security

No need to say the obvious. Successful farming relies on best practice farm management more than ever. When the soil moisture dries up the farm management options dry up as well.

Even so, there was always one option in most rainfall areas that will always be right, the management decision to build organic soil carbon and hold a lot more of the rain that falls inside the “root zone” of the soil.

Organic soil carbon provides the best means to store water right where you are going to need it. Shut down the run-off, evaporative and capillary cycles as much as possible and keep rainfall locked up in a carbon humus reserve, right where it fell, right where you farm.

The first step to immediately increase this “solid” water storage reserve is to make soil more friable and create the biological conditions to produce more organic soil carbon. Add quality carbon sources through stimulated biology, clever decomposition of stubbles, use of high quality humates and increasing the number of active, fibrous plant roots that are grown. This in turn adds more carbon to your soil which converts to soil humus. Organic soil carbon is incredibly efficient at swelling up with water while still offering the right size of water molecules for roots to easily access. The storage is significant, efficient and bankable in any soil environment that is moving towards optimal biology and balance.

Research shows that on average one part soil humus can retain four parts of soil water which means: if you increase your soils organic carbon by 1% it will retain an additional 14mm of rainfall (or 14.4 L) per square metre in the top 30cm AND this is in addition to the existing water holding capacity of the soil itself (see chart over).

Naturally, of course, the same effect occurs in reverse when soil organic carbon is reduced, water retention will be lost! The level of organic soil carbon is a direct indicator of the level of water holding capacity.

To make every millimeter of rain count you need to have in place the appropriate carbon structure in the appropriate production zone for plants. Holding out for more rain or pushing through the dry to get to harvest, either way your O.C. level will be a major factor in success.

Change in the capacity of soil to store water within levels of soil organic carbon (OC) to 30 cm soil bulk density 1.2 g/cm3. (Morris 2004)

Turning carbon into money; GRDC’s water use efficiency (WUE) example shows that improving soil water storage by only 5% (22 mm) increases gross margin by 21% through potential increases in crop yield (GRDC “Rain to Grain” 2007).
CARBON FARMING

RISING “C” IN SHORT

Brian and Stephanie Krieg, “Kriegfields”, Snowtown SA

Broadacre cropping on 400ha, lease 180ha + share farming

410mm average annual rainfall

2005 started BioLogical approach

Adequate nitrogen levels, maintained yield

Reduced disease pressure

2008 results 0.68% to 1.17% increase in soil OC

Snowtown farmers Brian and Stephanie Krieg implemented biological farming practices in 2005 after becoming concerned about increasing fertiliser and chemical inputs and undesirable screening results.

“Through the 1990s I was pretty concerned about our increasing use of urea and DAP; it was the same with other chemicals, we kept putting out more and more and not putting trace elements back” Brian said.

“I was trying to find a way to lower the costs of inputs and to increase the water and nutrient-holding capacity of the soil, so that when we have a dry finish, it doesn’t have such a disastrous effect,” he said.

The Kriegs have incorporated LawrieCo’s biological programs with their nearly continuous cropping production schedule. Including soluble humates and VAM seed dressing with reduced fertiliser at seeding time, foliar applications, stubble digestion and for the first time in 2008 Bio-Logical prescription blend application prior to seeding (see Kriegfields Typical Inputs).

Typical Inputs at “Kriegfields”

<table>
<thead>
<tr>
<th>Crop Establishment</th>
<th>Biological (since 2005)</th>
<th>Conventional (pre 2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertiliser</td>
<td>50-50 kg/ha 15:15 + Zn + Cu</td>
<td>80-100 kg/ha NPK + Zn</td>
</tr>
<tr>
<td>Soluble Humate Granules</td>
<td>5 kg/ha</td>
<td>Fertiliser +</td>
</tr>
<tr>
<td>Foliar Sprays</td>
<td>3.5 L ha⁻¹ Growth</td>
<td>50 kg/ha/ (occasioned)</td>
</tr>
<tr>
<td>1st Foliar Spray</td>
<td>1 x liquid Ferti</td>
<td>20:30 Urea/Herbicidal</td>
</tr>
<tr>
<td>2nd Foliar Spray</td>
<td>Similar to above</td>
<td>Trans elements from fungicide tests</td>
</tr>
<tr>
<td>Stubble Treatment</td>
<td>20 L ha⁻¹ Digest Fungi</td>
<td>10 L ha⁻¹ HM (legume sources)</td>
</tr>
<tr>
<td>Pre-Seeding</td>
<td>500 kg/ha/seed (since 2000)</td>
<td>60 kg/ha/seed</td>
</tr>
</tbody>
</table>

Since 2005 Brian and Stephanie have taken soil and tissue tests on an annual or biennial basis to tailor the nutrient requirements for each paddock, and the results have revealed some interesting points. Despite cutting out pre-seeding and foliar dressing applications of urea (50-60 kg/ha each), Brian commented that “out of the 14 tissue tests I took, none of them (crops) were nitrogen deficient”.

The most remarkable results have shown up in the soil analyses. All paddocks have shown increases in soil organic carbon. Markedly, the three paddocks where biological programs began in 2005, have shown an average increase in organic carbon (OC) of 1.17% and other paddocks where testing started in 2006 show an average 0.68% increase in OC.

Other observations at “Kriegfields” have included reduced disease issues; Brian said “previously we sprayed two to three applications per season of fungicide on bean crops, for the past three years we have not used any’.

“We have also noticed reduced stripe rust pressure in our wheat in low and high risk seasons” he added.

On yield, Brian reports that while he has not seen significant improvement, he has also not lost any either;

“My focus is on producing healthy crops with better nutrients and, of course, sustainable farm profitability” he said.

Putting theory into practice:

The top soil at Kriegfields now has an additional 48,960 – 124,240 L/Ha of water storage capacity!

Based on 0.68%–1.17% increase in OC in the top 15cm of soil and a soil bulk density of 1.2 g/cm³

(30% of Australian top soils have bulk densities in the range 1.2 to 1.8 g/cm³).

BUILDING SOIL CARBON

Australian soil scientist Dr Christine Jones has been working for the past 10 years on raising the profile of soil carbon processes, which she calls the microbial ‘carbon highway’. Here she simply explains how soil carbon builds:

If organic carbon begins and ends its journey as a gas, carbon dioxide (CO2), how does it get into soil?

The ‘way in’ for soil carbon is the process of photosynthesis in green leaves. The cheapest, most efficient and most beneficial form of organic carbon for soil is exudation from the actively growing roots of plants in the grass family, which includes many crop plants. The decomposition of fibrous roots is also an important source of carbon in soils. Organic carbon additions are governed by the volume of plant roots per unit of soil and their rate of growth. The more active, fibrous plant roots there are, the more carbon is added. It’s as simple as that.

Ref: Dr Christine Jones http://www.amazingcarbon.com
Millicent SA – Getting the Right Biologic Bug!

Millicent is having a very progressive change of attitude – based on practical local results. Increasingly farmers in the area are adopting Biological Farming Systems.

Conventional and Chemical based Agriculture is providing some options, but those who are strongly adopting biologic management and fertility programs as their primary decision making process are seeing their crops and pastures respond with healthier returns. Pest and disease problems are being minimised (completely gone in some cases) and better prescription designed nutrient programs are being implemented. Gross Margins are improving because expensive chemical inputs have been substantially reduced and the soil is being progressively freed of toxic load.

Several local farmers travelled to Ballarat in April 2008 to hear visiting American Biological Agronomist Dr Arden Anderson speak about biological production techniques and Dr Anderson was asked how to control snails. He replied that an effective soil microbial population would seek to consume the vast majority of snail eggs, as all eggs are a prime source of nutrition. Take home message from Dr. Andersen – Put Biology to Work, not to Waste! Give the soil microbial population every opportunity to eat those tiny snail eggs before they hatch and turn into far bigger problems. Tantanoola farmer Paul Serle has had the practical experience of a biologically productive soil beating down bigger problems. Paul has been using Soft Rock Phosphate (SRP) for 5-6 years now and gradually increasing the amount of other elements as mixes with SRP and through Fertigation in his centre Pivot. Tissue testing confirms that P & N levels are near optimum but there is still room for improvement by applying more Trace Elements.

The standard interpretation of Water Quality from his bore was "hard but acceptable"; tissue tests however were still showing extreme amounts of Sodium and Chlorides. By using Biologic Water Buff through his fertigation system, Na+ and Cl- levels have dropped significantly and the Lucerne (SrP) for 5-6 years now and gradually increasing the amount of other elements as mixes with SRP and through Fertigation in his centre Pivot. Tissue testing confirms that P & N levels are near optimum but there is still room for improvement by applying more Trace Elements.

 Improved plant health has been measured using a Brix Sap Sugar meter with summer afternoons recordings from 15% to 20%. Standing in knee high lucerne on the 2nd of June, Paul was pleased to see the Lucerne had solid, pith filled stems with healthy leaves all the way to the ground and a Brix reading of about 15%. This reading was difficult to read accurately because the ‘blur’ was wide, indicating good calcium and minerals concentrations in the sap.

NEVER TOO LATE TO DIGEST STUBBLE

At a recent BDG in Horsham I was both surprised and pleased to hear about a local stubble digestion program that ‘hadn’t’ gone to plan. Richard Hobbs farms at Sunnydale, a 1300ha mixed family farm located 40km South-West of Horsham. Approximately half the farm is cropped with the remainder supporting their 2500 breeding ewes.

Late last year, the decision was made to windrow the stubble from their cereal crops behind the header to allow the straw to be bailed and sold. Unfortunately, things didn’t go to plan, by March the straw was still laying in its windrows and the deal to bale and sell it had fallen through. With a reluctance to burn, Richard decided to run a slasher diagonally across the paddock to try and break down the stubble. This procedure had limited success with high stubble loads from his 3-5t/ha cereal crops still posing a problem for the upcoming seeding program.

Richard decided to implement a LawrieCo stubble digest program and even though this wasn’t applied until mid March it came with great success. Richard commented that his sheep did really well on it and was amazed at how much they ate. Richard sowed this year’s crop in early June and said there was no blockages or issues getting through the remaining stubble. “What little stubble was left was very brittle and just broke up, we had no problems at all”. In the future Richard will look to apply the stubble digest program straight after harvest and allow his sheep maximum benefit from the stubbles.

Peter Ham
Grass is growing the way it should

Greg and Wendy Rowan
Katamatite, Victoria
300 Head Dairy
Flood irrigated pastures
400-450mm average rainfall
Eradicated thatching
Increase pasture production
Stock easier to handle

On Greg and Wendy Rowan’s property at Katamatite in Victoria the “grass is growing the way it should”. This means it is not a dark nitrate green but a healthy colour and jumping out of the ground. Greg’s pastures over the last few years have been producing poorly and after seeing results on another biological property Greg started on the LawrieCo system.

Initially Greg applied a foliar spray BioLogic Growth, specific trace elements and Digest Fungi. There was significant thatching under Greg’s ryegrass/clover pasture and this has disappeared after the application of the brewed fungi. Greg was able to see the fungi that he applied at work on his thatch. The smell of the soil also improved. Traditionally on flood irrigated pastures the soil lacked smell but the fresh earthy smell has returned.

The response in pasture growth has been the greatest where Greg included Liquid Humic with flood irrigations and the tight red soil has become more open and friable. (See picture(s))

Pasture establishment has been excellent and the current rape crop is the best he has every produced.

In regards to the herd Greg reports “the stock now have shinier coats and are easier to handle.”

THE TRUE COST OF PROTEIN

Crude Protein % = Nitrogen % × 6.25

Proteins have a relatively stable concentration of Nitrogen at 16%. 100/16 = 6.25%, hence we use this simple calculation to determine protein concentration.

However, forages also contain non-protein nitrogen, which is often high following nitrogen applications, giving a misleadingly high protein reading.

Ruminants can only process so much true-protein and non-protein nitrogen. Excesses must be expelled which occurs at an energy cost to the animal. Visual symptoms from toxicities occur when there is just too much to expel, however the hidden cost is sub-clinical. Often animals grazing very lush, fresh pastures, fertilised often with high nitrogen fertilisers can exhibit decreased fertility, reduced growth rates and animal health issues.

Next time you take a feed test, take a closer look, it really is a matter of quality not quantity.

Peter Ham
Long Life Milkers

Peter and Sandy Gardner’s dairy property on the Fleurieu Peninsula SA are using biological methods to balance the soil, pasture and feed to improve herd health and achieve higher milk quality. Progress to date indicates the plan is on track.

THE DECISION

Previously at ‘Talamara’ high rainfall had leached soil nutrition and eroded precious top soil. This low fertility environment had led to poor pasture growth and difficulties with pasture establishment. Peter commented that “it had been difficult in the past to establish a ryegrass/clover pasture as the traditional cocksfoot out competes in the early stages of plant growth.”

“Our main reason for looking at biological options was the health of the herd. The herd had suffered from sore feet, low conception rates and also a lot of unusual health problems. We want to see the life of milk producing cows averaging eight to ten years.”

Listening to Dr Arden Andersen talk about stock health and how it related directly to pasture quality confirmed Peter and Sandy’s decision to use the biological approach.

“With no pastures growing we could relate to everything he said, with our herd health issues and unproductive pastures. After that day our decision was made to use biological methods in our production.”

EARLY BENEFITS – YIELD & QUALITY

In 2006 BioLogic Growth was applied as a foliar to a silage paddock and the results were a turning point. The annual testing of silage (used to calculate feed rations) for ME (metabolisable energy) and protein that year showed an improvement in the silage quality to ideal levels and despite the dry spring an average yield was achieved. Importantly, similar results were achieved in 2007.

Improvement in ME and protein has significant benefits to dairy production.

Peter explains “if protein is low then we have to supplement with lupins or something similar, so it is a real saving with the current price of feed supplements. Also our nutritionist recommends ME levels above ten, which we had not achieved prior to using the LawrieCo BioLogic Growth Foliar.”

PRODUCTIVE PASTURES

Good pasture establishment has been achieved this year with a combination of BioLogic Soluble Humate Granules and SureCropVAM, on paddocks where “nothing used to grow”. The Gardner’s have also seen a turn around in previously unproductive pastures after applications of lime and BioLogic Blend.

Past practice was to spread urea after pastures have been grazed, this year Peter has embarked on a foliar program where he will spray every paddock after each grazing with a combination of BioLogic Growth, BioLogic Liquid Fulvic and BioLogic Trace with Brewed Micro Life. The combined soil and foliar programs are moving pastures toward the ideal balance of clover and ryegrass.

The change in pasture has also been noticed by the herd; “the cows definitely find the pasture more palatable now and we don’t need to worry about nitrate poisoning” Peter reports.

THE HERD

In 2007 the herd’s sore feet issues were significantly down from previous years. Also Peter comments “the cows have shinier coats and are more content making them easier to handle; especially the younger stock who used to be jumpy and agitated.”

THE MILK

The Gardner’s have maintained milk quantities at the district average and this winter have noticed an improvement in quality. Peter said “the butterfat and protein in the milk has held up this winter, when we would normally see it drop off.” Bonuses are paid per litre of milk with higher butterfat and protein levels, giving a true economic advantage to the Gardner’s biological approach.
The use of liquid fertiliser at seeding time is continuing to expand with a dozen clients seeing the benefits of switching from solid fertiliser. Some of the benefits of switching are

- Successful outcomes: Liquid inject operations at Lake Bolac and Horsham used BioLogic liquid fertiliser successfully in 2007.
- Efficient handling: Liquid fertiliser places NPK, trace elements, biology, humates and SureCrop VAM into the seeding slot in one mix. All products can be pumped from holding tanks to the Grouper truck now fitted with liquid handling equipment. Both seed and super boxes can be filled with seed.
- Cost-effectiveness: Liquid is more cost effective than solid fertiliser at seeding.
- Cleaner operation: No dust is also a benefit.

Making the Move

Farmers implementing liquid inject in 2008 have met to discuss machinery set-up, fertiliser mixes and other issues. While there are a variety of setups available, most of the group decided on one machinery system. Even so, there are some variations between the rigs, and I have been in the field observing what is working best, and identifying areas for improvement.

There are also variations in the liquid mixes, a few of the group are planning to start solid and then overlay it with liquid to give them time to assess the best combination going forward. It also allows them to have a biological program with the conventional base.

Phil Smith (pictured) fitted his specially-equipped CAT with saddle tanks which can carry 800L each. The computer-controlled tanks deliver the liquid via a hydraulic pump to the gravity fed distribution heads. Phil operates in sticky country where it’s important to limit the wheels on the ground. The saddle tanks were an ideal alternative to towing an extra liquid tank with greater capacity.

The day this picture was taken, Phil was seeding wheat at 12.5 km/hr on a 2cm GPS accuracy with a smile from ear to ear. “The slowest part is when you go to take off, it takes me 2 minutes to turn everything on like a pilot would, but I will need the DVD player tomorrow as there is nothing to do between each end of the paddock”. “This is great” he said.

Phil actually ran short of liquid at one point and still had some DAP in the bin. He just hit the switch and finished the strip he was on – farm trial complete. He will watch this strip through out the year.

Looking ahead

The liquid approach is expanding quickly and given the ease of operation and flexibility of the program it looks like being very exciting for biological farming.

For the rest of the crop cycle, the program remains unchanged. First foliar on at 4-6 weeks followed by the second as the crop begins to run up about GS32 for cereals. The crop is then monitored and managed through tissue and sap tests along with Brix reading.

We expected by the end of the season to have solid data to feed back to all those interested in using liquid next season. As with all new systems, forward planning is essential for success.

I would like to take this opportunity to thank all the clients who are in the liquid inject group for their positive can-do approach. They’ve shown the willingness to lead the project from its infancy to a rapidly growing concept with great potential for changing the way we seed our crops in the near future.

Tim Watt

Retain and Gain C with BioLogic

A key feature of all BioLogic products and programs is carbon, from carbon based products (Soluble Humate Granules, BioLogic Blend, Liquid Fulvic and Humic), specific carbon building biology (Digest fungi) to foliar sprays that promote root exudates and therefore carbon building processes in the soil.

All LawrieCo BioLogic products are designed to help you retain and gain soil carbon.
**BioLogic – The Systematic Approach**

Matt and Simon Vogt and father Barry work together on their mixed farming property near Kapunda. Since 2006 they have incorporated biological systems into their cropping and stock production. BioLogic Blend, Seeding, Foliar and Stubble Digestion are part of the programs the Vogts have used.

Recently they had a chat with LawrieCo field advisor Burt Naude about their move to biological systems.

**What major factors do you consider lead to a successful family business?**

- Look after the soil health, improve soils and stop the depletion of carbon. Better water use efficiency, water holding capacity and maximising pastures production.
- Pasture improvement and increased carrying capacity will be the focus from here on.

**What triggered an interest in LawrieCo’s Biological farming systems?**

Barry comments: “I was always interested in soils. When I was looking for options there were many ideas out there which a few farmers here and there were using. It was only after we started with LawrieCo that the real issue of a whole farm system was promoted and the biological idea became more attractive.”

The next step is the application of biology to address a hard pan issue. We believe that the soils are ready to accept biology. The family will brew their own microbes this year and rely on the microbes to address compaction issues in the future.

**What are the most important trends in your business?**

Gross margin solves everything. It was important to maintain production as well as margins and the biological farming system has stood up to this through the years.

**What observations have you noticed?**

- 2006 Canola had 3% higher oil on biological patch (42% and 39%) and there were lady birds evident on biological paddock.
- 2007 Dry finish and yields were down. Grain was better quality.
- 2008 Fertiliser cut back to 70% of average. Germination and early development is very good. Soils have friability and the organic matter in the soils impressive. There were at least three earth worms in every hole we dug.
- Barry and Matt are also convinced that water infiltration has improved significantly as “they can get on paddocks much sooner after a rain event than in the past.”

**ScienceDaily (June 29, 2008) — A soil constituent known as glomalin provides a secure vault for the world’s soil carbon. That’s according to Kristine Nichols, a microbiologist at the Agricultural Research Service (ARS) Northern Great Plains Research Laboratory in Mandan, N.D.**

Glomalin is a sticky substance secreted by threadlike fungal structures called hyphae that funnel nutrients and water to plant roots. Glomalin acts like little globs of chewing gum on strings or strands of plant roots and the fungal hyphae. Into this sticky “string bag” fall the sand, silt and clay particles that make up soil, along with plant debris and other carbon-containing organic matter. The sand, silt, and clay stick to the glomalin, starting aggregate formation, a major step in soil creation.

On the surface of soil aggregates, glomalin forms a lattice-like waxy coating to keep water from flowing rapidly into the aggregate and washing away everything, including the carbon. As the builder of the formation “bag” for soil, glomalin is vital globally to soil building, productivity and sustainability, as well as to carbon storage.

Nichols uses glomalin measurements to gauge which farming or rangeland practices work best for storing carbon. Since glomalin levels can reflect how much carbon each practice is storing, they could be used in conjunction with carbon credit trading programs.

In studies on cropland, Nichols has found that both tilling and leaving land idle—as is common in arid regions—lower glomalin levels by destroying living hyphal fungal networks. The networks need live roots and do better in undisturbed soil.

When glomalin binds with iron or other heavy metals, it can keep carbon from decomposing for up to 100 years. Even without heavy metals, glomalin stores carbon in the inner recesses of soil particles where only slow-acting microbes live. This carbon in organic matter is also saved, like a slow-release fertiliser, for later use by plants and hyphae.

So how do you produce Glomalin? A good way is to apply LawrieCo Digest Fungi onto your stubble.

**Combining the best of conventional and natural farming: Broadacre, Horticulture, Viticulture, Turf, Dairy & Livestock**
BioLogic Growth
In Victoria

LawrieCo BioLogic Farming Programs are attracting serious attention across Australia, especially with many new clients in Victoria. To ensure we continue to produce the best BioLogic outcomes for all our clients LawrieCo welcomes two new Field Consultants who will be based in Victoria.

Mat Newland comes from an intensive horticultural background with Boomaroo Nurseries, Australia’s largest vegetable seedling nursery. In his 12 years at Boomaroo Mat had a strong focus on crop protection (P&D), explored the industry nationally and internationally, developed DPI protocols in P&D and trained staff and growers in all aspects of production.

Mat backs up this experience with an Advanced Diploma of Horticulture & Diploma in Project Management. Mat's interest in biological practices was sparked by a desire to reduce chemical usage in pest and disease controls.

Mat will be based at Lara near Geelong in Victoria. Mat pictured (left) inspecting growing and disease control techniques in Netherlands greenhouse operation.

Peter Ham comes to LawrieCo from a farming background growing up on a small sheep farm located at Woolsthorpe, just north of Warrnambool. He has worked on cropping, dairy, beef and sheep enterprises in four different states and has a Bachelor of Agricultural Science obtained with first class Honours.

Pete has a committed interest in the stud sheep industry being the owner of ‘Gnotuk’ Border Leicester Stud which he started in 2004 and now comprises of around 100 breeding ewes and replacements.

He became interested in biological methods through the relationship of pasture inputs, to feed nutrition and stock health and performance.

Pete will be based at Hamilton Victoria.

Regional Field Consultants

- Burt Nuade 0427 557 789 South Australia & Sunraysia
- Tom Pickhaver 0429 811 002 Central Districts SA
- Tim Watt 0428 568 684 South East SA
- Trevor Cook 0402 811 005 Western Districts - Lismore Vic
- Vaughn Maroske 0418 530 369 Wimmera Region Vic
- David Clayfield 0407 091 250 Technical Advisor
- Peter Ham 0428 268 059 Western Vic
- Mat Newland 0409 822 011 Central & S.E. Vic

Other Staff

- Adrian Lawrie 0418 811 237 Managing Director
- Andrew VanderSluys 0409 333 543 General Manager
- Olivia Grivell Operations Manager
- Robert Mugford Production & Logistics Manager

Congratulations
to Andrew VanderSluys, recently appointed as General Manager of LawrieCo and taking over responsibility for anything that goes wrong!

Here’s his mobile number 0409 333 543

LawrieCo: Contacts

Back Paddock Items:
Can any body please advise the new owner/s of a STIEGER tractor how to get more horsepower out of it?
Tick the correct answer from following options:

- Tow smaller implements
- Check air intake for bird nest
- Rebuild motor
- Trade-in on new tractor

First correct answer drawn will receive a bottle of wine.

If you can also name the owner/s of the STIEGER in question you are eligible for a special prize.

Send all answers or new BACK PADDOCK ITEMS to Tim Watt.

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